

Accordion-like Silver Nanorods Array for Exhibiting Multiple Electromagnetic Responses

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We realized a high-density array of “accordion-like” plasmonic silver nanorods over a large area (~cm²) exhibiting multiple electromagnetic responses in visible and near-infrared (NIR) wavelengths. This array of “accordion-like” silver nanorods was fabricated by confining lamellar-forming polystyrene-block-poly (methyl methacrylate) copolymer (PS-b-PMMA) inside cylindrical pores of aluminum oxide (AAO) template grafted by thin neutral brush layers. PS and PMMA lamellar nanodomains with the sizes of ~15 nm were alternatively stacked along the nanorod direction. After the AAO template was removed, a 5 nm thick layer of silver was thermally deposited on only PS nanodomains. Due to the multiple resonances exhibited in the visible and NIR regimes, the array could be used for multi-analyte detection. Furthermore, this concept of fabricating sophisticated nanoscale architectures by utilizing block copolymer self-assembly and incorporating plasmonic metals into one nanodomains could be applied to realize large-scale metamaterials working at visible and NIR wavelengths.